Space Weather Technical Forecast

Issued on Wednesday, 19 June 2024 at 13:00 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Occasional M-class flares likely (R1-R2 radio blackouts).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been moderate with isolated M-class flares, the largest of which was an M2.4 at 18/1123 UTC from AR3712. Additionally, AR3711, near the western limb, produced an M1.1 flare at 19/0630 UTC.

There are five sunspot numbered regions on the disc. AR3709 and AR3708 have now rotated over the western limb, and AR3711 (Axx/alpha) is becoming difficult to analyse as it too approaches the western limb. The three largest sunspots are just west of centre disc. The most notable is the southernmost, large AR3712 (Ekc/Beta-Gamma-Delta), which has continued to show some separation in its complex intermediate portion, although just about retains a small delta configuration. The other southern spot, AR3713, (Esi/Beta-Gamma) has continued to show emergence and development of leader and intermediate spots, while the northern spot, AR3716 (Dao/Beta) has seen some enhancement in its intermediate spots in recent hours.

A filament eruption occurred in the northeast of the disc at 19/0918UTC and could potentially give a CME with an Earth directed component. However, analysis of this CME is pending, awaiting on relevant coronagraph imagery. Other than this there were no Earth-directed CMEs in the past 24 hours.

Solar Wind / Geomagnetic Activity: Fast wind influence from CH45/+ was observed, with solar winds elevated between 550-600 km/s until around 18/1500UTC, a declining trend was then observed falling to current values of around 530km/s. Density was below average. Interplanetary Magnetic Field (IMF), Bt, was at weak levels eventually mostly around 4-5nT. The north-south component, Bz, showed a similar profile, with values between +4nT and -5nT. Phi angle was predominantly negative (towards the Sun). Geomagnetic activity has been Quiet to Unsettled (Kp 1-3).

Energetic Particles / Solar Radiation: The high energy (greater than 10 MeV) proton flux observed by GOES18 remained at Background. High energy electron flux (greater than 2MeV) observed by GOES16 was predominantly at Background, with the associated 24-hour fluence well below Active. Observed fluence at 19/0000UTC was 1.76e6 integrated pfu.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate activity is expected with further M-class flares likely and a slight chance of isolated X-class flares. These most likely from AR3712.

Solar Wind / Geomagnetic Activity: A CME associated with a filament eruption from the northwest of the disc at 19/0918 UTC is waiting on relevant coronagraph imagery for analysis. Other than this there are no Earth-directed CMEs, and current elevated solar winds due to CH45/+ are expected to gradually ease through the next couple of days. There is a chance of a further enhancement later on day 3 (21 Jun), from any influence of CH46/-, however this is low confidence.

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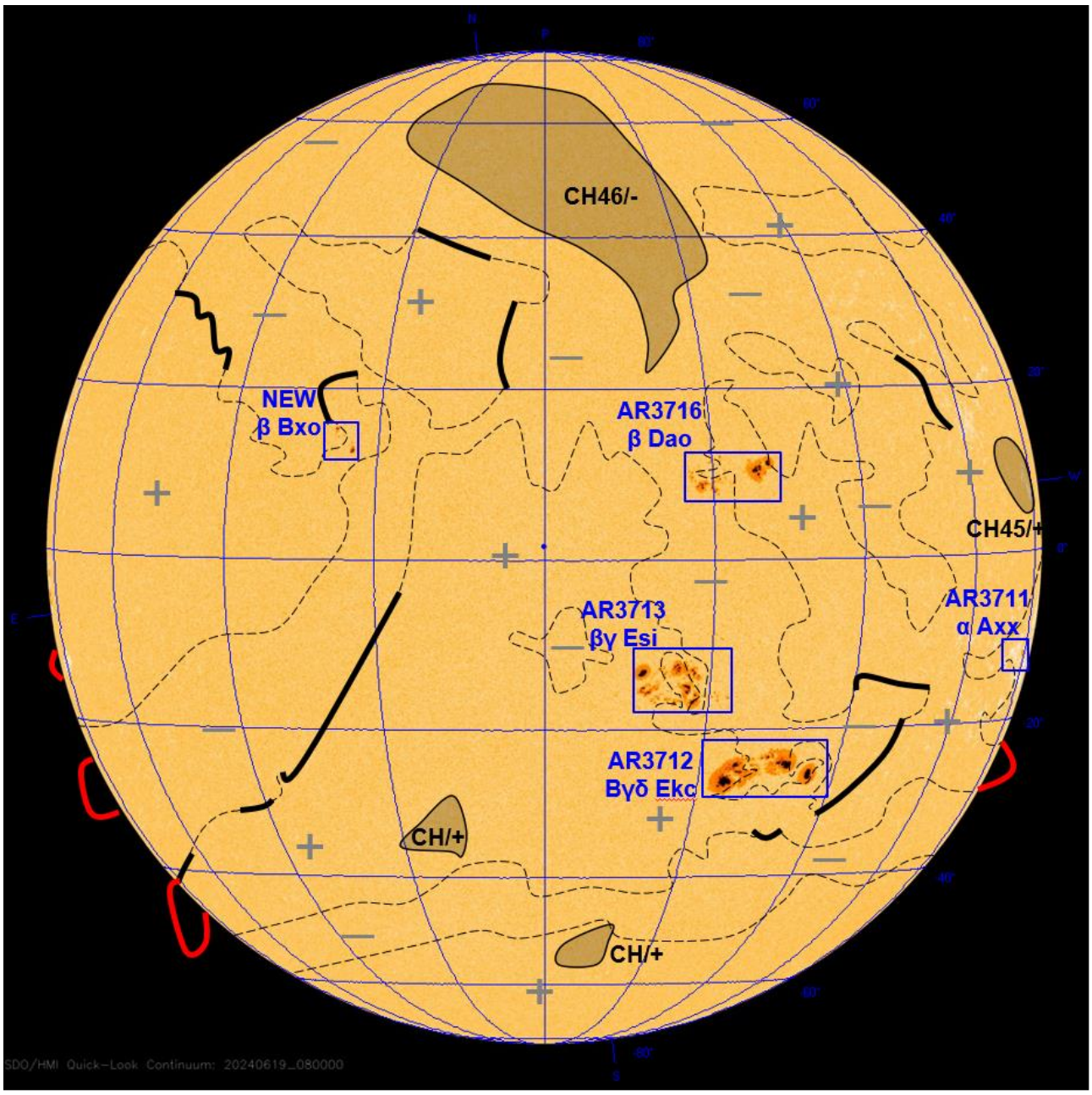
Mainly Quiet to Unsettled geomagnetic activity is expected. There is a chance of isolated Active intervals with either of the fast wind enhancements, mainly early day 1 (19 Jun) or later day 3 and into day 4 (21 and 22 Jun).

Energetic Particles / Solar Radiation: High energy proton flux is expected to remain at Background, but with a slight chance of enhancement given any notable flares, predominately from AR3712. This gives a slight chance of reaching the S1 Minor Storm threshold. High energy electron flux is forecast to be at predominantly Background, but with a chance of diurnal rises to Moderate, however the associated 24-hour fluence is expected to remain below the Active threshold.

Figure 1. Solar Analysis Valid 19/0800 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

A filament eruption occurred in the northeast of the disc at 19/0918UTC and could potentially give a CME with an earth directed component. However, analysis of this CME is pending, awaiting on relevant coronagraph imagery. Other than this there are no Earth-directed CMEs, and current elevated solar winds due to CH45/+ are expected to gradually ease through the next couple of days.

MOSWOC Enlil is currently suggesting a further enhancement from the large north central disc coronal hole CH46/-, peaking by day 3 or 4 (21 or 22 Jun). This is currently considered over-estimated in both strength and southern extent in Enlil, with 27-day persistence supporting this, as no significant enhancement was observed on the previous rotation. However, given the slightly more northward location of Earth, a slight increase is considered possible on this rotation, albeit with low confidence, with winds perhaps becoming slightly enhanced by the end of day 3 (21 Jun), or into day 4 (22 Jun).

Mainly Quiet to Unsettled geomagnetic activity is expected. There is a chance of isolated Active intervals with either of the fast wind enhancements, mainly at first on day 1 (19 Jun) or later day 3 and into day 4 (21 and 22 Jun).

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	1	5	10
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Nil

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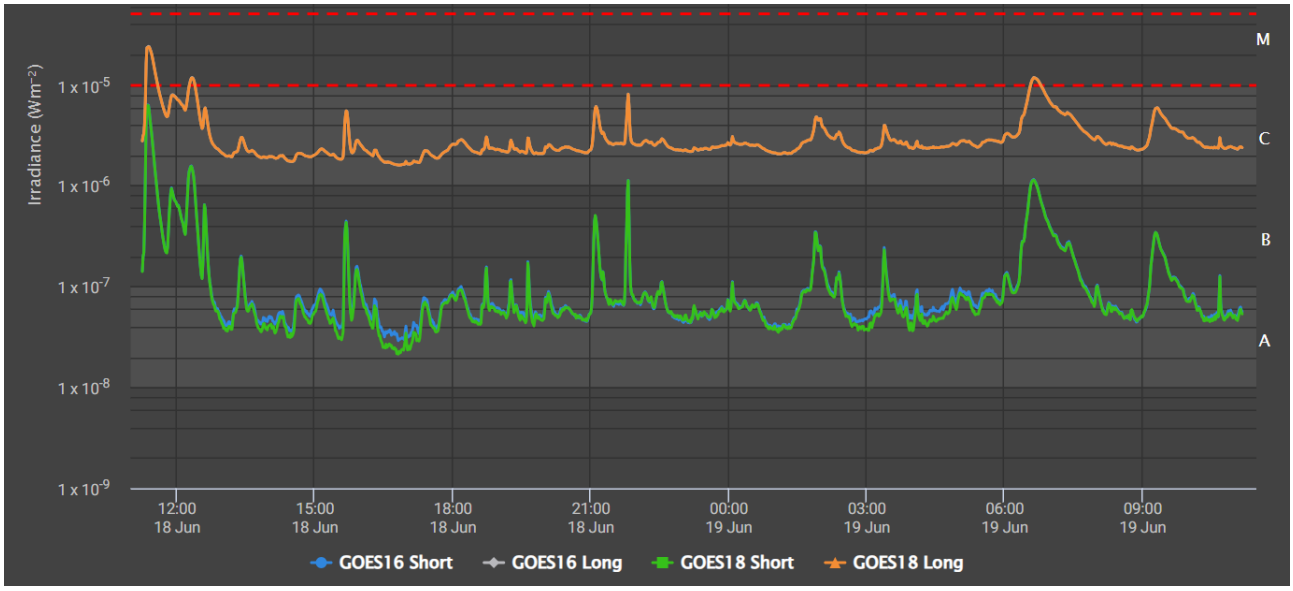
Radio Blackouts - X-Ray Flares:

Moderate activity is forecast with an ongoing likely chance of M-flares, and a slight chance of isolated X-class flares.

There are five sunspot regions on the disc. AR3709 and AR3708 have now rotated over the western limb, and AR3711 is becoming difficult to analyse as it too approaches the western limb. The three largest sunspots are just west of centre disc. The most notable is the southernmost, large AR3712, which has continued to show some separation in its complex intermediate portion, although just about retains a small delta configuration. The other southern spot, AR3713, has continued to show emergence and development of leader and intermediate spots, while the northern spot, AR3716 has seen some enhancement in its intermediate spots in recent hours.

There are a number of potential returning regions in the period, however seismic data and current imagery at the east limb do not appear to show any particularly significant regions are imminent.

Figure 2: Latest 24hr GOES16/18 X-Ray flux trace



X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	Yes	70	70	70	70
Very Active	R3 to R5 X Class	No	15	15	15	15

Solar Radiation Storms - (High Energy Protons):

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GOES-18 proton flux remains at background, with no solar radiation storms occurring. However, any significant flares, most likely from AR3712, have the potential to increase the observed flux at GOES. This brings a slight chance of reaching the S1 Minor Storm threshold, with this risk increasing slightly as this region moves further onto the western disc.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	10	15	15	15
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

High Energy Electrons Event (≥ 2MeV):

High energy electron flux, as observed by GOES-16, is expected to persist at mainly background levels, perhaps rising a little to Moderate values at diurnal peaks as a consequence of the recent fast wind onset from CH45/+.

The associated electron fluence is expected to persist below the Active threshold, perhaps rising a little in response to the recent enhancement. This is supported by MOSWOC REFM which is currently considered to be providing good guidance.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	1	1	5	5
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

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